A Global Strategy
for the conservation and use of Coconut Genetic Resources
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LA RECHERCHE AGRONOMIQUE POUR LE DÉVELOPPEMENT

COGENT
Coconut genetic resources for enhanced livelihoods

Bioversity International

publishable results. Donors and ministries often seem to prefer funding projects that give substantial results in 3 to 5 years, instead of funding coconut experiments that need 12 years to give complete results. A longer-term vision, a sense of general interest and working for the future generations need to be vigorously promoted.

... but some pleasant characteristics!

On the other hand, the plant has some advantageous characteristics. Its year-round production allows for a balanced planning of any breeding programme. No inter- or intra-varietal sterility has ever been observed, although pollen competition may occur (Sangare 1981). Its perennial nature allows for long-term conservation over successive generations and within living collections as well of multiple uses in experiment over a long period of time. Last but not least, coconut grows mainly in attractive coastal tropical locations, mostly close to the sea, and many coconut research centres can be regarded as small paradises from aesthetic, environmental and human perspectives.

1.1.5 Major threats to coconut genetic resources

Despite the existence of more than 1500 live coconut accessions in 24 *ex situ* collections worldwide, including 730 accessions that are held in 5 international genebanks, much of this germplasm remains greatly underused, or indeed at risk, due to the lack of adequate long-term funding to ensure that it can be conserved and utilized safely and effectively. Main threats to coconut genetic resources include:

- Social dynamics linked to coconut symbolism and inducing low commitment to conservation and use of genetic resources;
- Emerging diseases and pests;
- The environmental and social consequences of climate change and extremes;
- Economic aspects;
- Lack of capacity and other resources.

Social dynamics linked to coconut symbolism

The lack of adequate long-term funding for coconut research and *ex situ* genebanks is part of the social dynamics threatening coconut genetic resources. The ambivalent and multifaceted symbolisms associated with the coconut palm sometimes make stakeholders and even decision-makers forget that coconut cultivation strongly influences the livelihoods of millions of poor farmers. An ethnological approach of coconut symbolisms and their consequences was recently developed for the Pacific region. The modern representation of the Pacific islanders' coconut palm often appears as ambivalent. Caillon (2008) described the coconut palm's modern change of status in Vanuatu: the coconut is perceived by local people as the tree "of the Whites" mainly for its relation to the place. Quite similar representations are found in Polynesia, although the expression "plant of the Whites" was not encountered. If this "relation to the place" is indeed significant, these ambiguous representations also come from memories of the gruelling colonial times, from "westernization" and, as explained hereunder, from the simplistic coconut symbolism conveyed by globalization (Bourdeix et al. 2013).

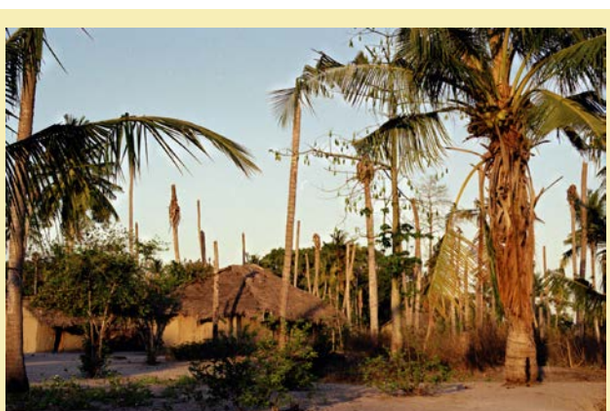
In the past, many islanders were forced to work in coconut plantations or at smoky copra drying ovens, during a period when many died from imported diseases. In the collective Western imagination, the coconut palm has become a symbol of exoticism and tropical beaches. It is well-known that the image of the coconut palm is widely used to promote tourism and numerous associated products ranging from fashion accessories to financial investments. The combination of coconut with "hammocks" or "monkeys" sometimes reinforces the stereotype of peaceful paradise, far from the stresses of everyday life, an image which does not reflect the true situation of Pacific islands. Islanders become disengaged when confronted with such counterfeit representations that standardize the tropics and diminish their cultural identities.

For reasons linked to both colonization and globalization, many Pacific islanders simultaneously "love" and "hate" this emblematic palm. Their attitude towards the coconut is often a mixture of reverence and contempt. Nevertheless, in short discussions with local people elsewhere in the Pacific, they rapidly change their mind and acknowledge coconut palm as an integral part of their traditional cultures.

In other tropical regions, symbolisms associated with the coconut palm appear to be less ambivalent than in the Pacific. For instance, Balinese women were traditionally forbidden to even touch the coconut tree: females and coconut trees both share the ability to reproduce and men fear that a woman's touch may drain the fertility of the coconut tree into her own fertility. Another surprising example of social representation linked to coconut palm came a few years ago from the Philippines (L. Sebastien, personal communication): a Bioversity International research manager was told that: "when you see coconut palms in the landscape, you know that rebels are living there". Coconut palms and the poorest people are located in the same places. Because of these ambivalent representations, the value of implementing and funding research projects on coconut is sometimes questioned by stakeholders and decision-makers.

Emerging diseases and pests

In many countries, diseases and pests seriously threaten coconut cultivation and conservation of genetic resources. The main diseases are caused by a group of phytoplasmas[18]. Often but not always they are called "Lethal Yellowing diseases" or "Lethal Yellowing like syndromes". Phytoplasmas cause highly destructive, fast spreading diseases in coconuts and many other palm species. In Papua New Guinea, Bogia disease was identified in 2012 at 15 km from the International Coconut Genebank for the Pacific Region. This disease, also destroying betel nut and even some varieties of



Coconut grove devastated by Bogia disease near Madang in Papua New Guinea. (R. Bourdeix)

[18] Phytoplasmas are obligate bacterial parasites spread by insect vectors.

banana, has forced researchers to relocate the genebank to a disease-free area. In Côte d'Ivoire, a phytoplasma disease discovered in 2012 is now spreading in the Grand-Lahou region within 120 km of the International Coconut Genebank which has been involved in almost half of the international germplasm movements during the last 20 years. A duplication of this genebank is also envisioned to ensure the survival of the accessions.

Other most important diseases are the Cadang-Cadang viroid in the Philippines, the Foliar Decay virus in Vanuatu, and various forms of *Phytophthora* killing the palms and/or causing massive premature fall of immature fruits. The most important pests are: the beetles *Oryctes rhinoceros* and *Scapanes australis*, which eat young leaves and facilitate infestation by other insects (red palm weevil *Rynchophorus* sp.) which penetrate the heart and kill the palm; Red Ring disease caused by xylophageous nematodes in Latin America; the coconut eriophyid mite (*Aceria guerreronis* Keifer) which attacks the surface of fruit and strongly reduces their size, leaf-eating caterpillars; the white grub (*Leucopholis coneophora*), whitefly (*Aleurodicus* and *Aleurotrachelus* spp.), and the hispine beetle (*Brontispa longissima*) that cause considerable damage in numerous locations. Leaf hopper insects are known to be vectors of lethal diseases.

Climate change and hazards

Climate change, drastic changes in land use and progressive replacement of traditional coconut varieties with modern ones causes irreversible genetic erosion unless further steps are taken to conserve materials *in situ*, or to collect and conserve them *ex situ*. Traditional varieties growing on low atolls in the Pacific region and on low river deltas in all regions are especially endangered by rising sea-levels and flooding. Resistance to strong winds and cyclones is also an important consideration in many islands.

Genetic studies suggest that the material held in *ex situ* genebanks does not adequately represent the known range of diversity. More genetic variation remains to be described and collected in farmers' fields and in some remote locations where coconut palms may grow beyond human influence. Much of the germplasm in *ex situ* collections is inadequately duplicated outside of the host collection, mainly due to lack of funding.

National laws that restrict access to plant genetic resources have emerged in many countries. The introduction of Intellectual Property Rights (IPRs, e.g. UPOV variety protection) for new varieties and their genetic components in developed countries, the recognition of national sovereignty and restrictions to access genetic resources have made the availability of genetic diversity in recent years much more difficult. Insufficient communication and dissemination of reliable information on coconut accessions held in genebanks hinders efficient management and thus, significantly reduces their value to breeders, farmers and other investors.

Economic aspects

During the last 20 years, many countries have not invested sufficiently in coconut breeding, and seednut production, and interactions with coconut farmers have been inadequate. This was mainly caused by unacceptably low farm-gate prices reflecting

market conditions. Low prices for copra and oil, and their high market volatility, led to lower interest in replanting coconut even in places where local consumption was crucial for livelihood. The intense development of oil palm plantations has also caused a certain loss of interest in coconut, from both farmers and researchers. Many researchers working on coconut shifted to oil palm, coffee or cocoa. Big companies planting crops on an agro-industrial scale can afford to support larger research budgets unlike the millions of small coconut farmers.

Tender Coconut street seller in Tonga. (R. Bourdeix)

Coconut cultivation is actually undergoing a strong revival. In November 2013, delegates from the governments of 13 Asia-Pacific countries, including eight Ministers of Agriculture, participated in a FAO Regional Consultation on Coconut Sector Development in Asia and the Pacific. They concluded that replanting of coconut trees on a massive scale is required if the coconut producing countries of Asia and the Pacific are to meet the world's rapidly growing demand for coconut products. According to Hiroyuki Konuma, the FAO Regional Representative: "Asia and the Pacific's aging coconut trees simply can't keep up with the growing demand…/… Indonesia, the top producer, would need to replant some 450,000 hectares". For instance, Thailand, who has diversified into a variety of export products such as virgin coconut oil and aromatic coconut water, is presently importing coconuts from Indonesia and Vietnam to feed its industry. Thus, the global economic situation seems now more favourable to coconut cultivation.

1.1.6 The International Coconut Genetic Resources Network – COGENT

In 2017, COGENT gathers 39 country-members and is organized into 5 regional sub-networks: Africa and the Indian Ocean; Latin America and the Caribbean; South Asia and Middle East; Southeast and East Asia; and the South Pacific. Table 1.1 provides a list of the member countries. COGENT brings together national and international players in both public and private sectors and promotes funding opportunities for conserving and utilizing coconut genetic resources.

Coordinating the global conservation of coconut genetic resources relies largely on COGENT, with support from ACIAR, Bioversity International, CGIAR and CIRAD. The other main institutions which coordinate international coconut research projects are APCC, SPC and ACIAR.